

JPRS 75889

17 June 1980

# China Report

AGRICULTURE

No. 86



FOREIGN BROADCAST INFORMATION SERVICE

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## I. GENERAL INFORMATION

### WARNING AGAINST WEATHER DAMAGE TO WINTER WHEAT ISSUED

Beijing RENMIN RIBAO in Chinese 19 May 80 p 1

[Article: "Guard Against Damage to Wheat from the Dry Hot Wind"]

[Text] Currently winter wheat has already reached the late period of growth, and the Central Weather Observatory suggests that all wheat producing areas should be on guard against damage to wheat from the dry, hot wind.

The dry, hot wind is the main enemy of winter wheat in the north during the late period of growth. It generally appears between the last 10 days of May and the middle 10 days of June, most frequently in the last 10 days of May and the first 10 days of June. According to statistics from the meteorological departments, there is an average of about 10 days of dry, hot wind weather in the north every year, while the dry, hot wind weather in the main wheat producing areas of south Shanxi, south Hebei, southwest Shandong, south Shandong, north Henan and east Henan averages 13-18 days.

The period in which the dry, hot wind appears corresponds to the milky and waxy stages of northern winter wheat. During this period, the air temperature most favorable for wheat growth is between 20° and 22° C, while the most desirable relative humidity is between 60 and 80 percent. But when dry, hot wind weather begins, the maximum temperature generally exceeds 30° C, and the relative humidity is generally below 30 percent. The high temperature, low humidity and southerly winds can intensify transpiration in the wheat plants, disrupting the moisture balance, and in serious cases can cause a major drop in wheat yield.

The Central Weather Observatory points out that this year the weather conditions for growth and development of winter wheat in the northern part of the country were relatively poor, and dryness, low temperatures, and in some areas an excess of overcast and rainy weather have caused a good many wheat plants to be weak and spindly and have delayed the growth period, which is extremely unfavorable for resistance to the dry, hot wind. Accordingly it is suggested that the wheat producing regions should take this year's hot, dry wind seriously and should take active and effective steps to guard against hot, dry wind damage and to make a success of summer grain production.

# GRAIN PRICES SAID STABLE ON RURAL MARKETS

Anhui's Dianbu Township

Beijing RENMIN RIBAO in Chinese 9 May 80 p 2

[XINHUA NEWS AGENCY report: "Trading Is Active on Rural Anhui Markets"]

[Text] On 28 April, the marketplace in Dianbu township, Feidong County, Anhui Province was still filled with rice, barley, wheat, peanuts, soybean, green beans, dehydrated potato slices, peanut oil, cotton seeds and a variety of feeds although the roads there remained muddy after rain. This indicated that peasants throughout rural Anhui still could supply the markets with great quantities of various agricultural goods after selling fixed amounts of their produce to the state. On 28 April, rice and wheat were priced .27 yuan and .20 yuan per jin, respectively. When this correspondent scooped up a fistful of rice by hand, and asked for its price before a shop, its owner enthusiastically replied: ".27 yuan per jin. The price of such high quality rice remains negotiable, depending on how much you want to buy." The manager of this marketplace told this correspondent that the economy of Dianbu township was dominated by a medium-sized market for grains and edible oil. During every trade fair, the amounts of rice and edible oil brought by peasants for sale ranged from 30,000 jin to 60,000 jin. Since last winter, the prices of rice and wheat have been stable with a fluctuation rate of .02 yuan. The market prices of peanut oil and wheat were even slightly lower than the purchase prices set by the state.

According to statistics tabulated by the Anhui provincial departments concerned, since the beginning of this year, the market prices of rice and edible oil have been stable in 11 marketplaces located in Huaibei, and central and south Anhui, and were believed to be even lower than in the corresponding period of 1979, or as low as the prices by the end of 1979. A survey of 11 marketplaces showed that rice, wheat, soybean, peanuts, and edible oil were charged .272, .246, .46, .65 and .95 yuan per jin respectively.

## Sichuan Trade Fairs

Beijing RENMIN RIBAO in Chinese 9 May 80 p 2

[Report on A Survey of 37 Rural Trade Fairs in Sichuan]

[Text] On the morning of 29 April, the selling and buying of rice and edible oil at the Longchuanyi Township Trade Fair at the foot of the Longchuan mountain in the eastern part of the Chengdu plains reached a peak. Bamboo baskets and burlap bags full of rice, wheat and corn were lined up in a long row, and trading was very brisk. A young peasant bought 81 jin of high quality corn at a price of .28 yuan per jin to his great satisfaction. The prices of other food grains remained unchanged since early this month. For example, the prices of rice ranged from .35 to .36 yuan, and wheat from .265 to .28 yuan per jin. The Longchuanyi District Food Bureau even forecast a downward trend in the prices of food grains as soon as summer crops are harvested and brought to the markets.

Longchuangyi Township was one of 37 marketplaces surveyed by the Sichuan Provincial Industrial and Commercial Administrative Bureau and the Sichuan Food Bureau which found that their prices generally remained unchanged. During the first 20 days of April, the prices of rice, corn and wheat were up only .01 yuan per jin as compared with prices by the end of the previous month. Since the beginning of May, the Sichuan Provincial Food Company which buys and sells grains at flexible prices has supplied the market with a considerable amount of food grains, thus causing their prices to drop in Sichuan Province.

## Jiangsu Price Decrease

Beijing RENMIN RIBAO in Chinese 9 May 80 p 2

[Report: "Prices of Rice Are Down in Jiangsu"]

[Text] During the first quarter of this year, the prices of rice and edible oil on urban and rural markets in Jiangsu Province dropped slightly. The prices of rice averaged .29 yuan per jin throughout the province, the lowest ever since 1960, and were slightly higher in such cotton belts as Rugao and Rudong counties than in the rest of the province. Statistics tabulated by 19 rural market and trade liaison offices throughout the province show that during the first 3 months of this year, the sales of food grains reached 870,000 yuan, or 1.6 percent more than in the corresponding period of 1979; the prices of food grains and edible plant oil were down 15 percent and 2 percent respectively as compared with 1979.

At present, the average per-jin market prices of rice, sorghum, soybean, dehydrated potato slices, sesame, peanuts, and edible plant oil are .29, .23, .56, .15, 1.09, .82, and 2.07 yuan respectively.

Editor's note: the aforementioned news reports presents a delightful picture of a booming market in rural China. In the past, rural China faced shortages of agricultural products at the turn of every spring and summer. Today, gone are such shortages; the prices of rice and edible oil are stable and both buying and selling are normal. This success should be attributed to the effective implementation of the two documents on agriculture. There is still room for further improvements in the policy implementation. As long as we persist in implementing the party's policies for the countryside, the rural economy is bound to gain strength.

9574

CSO: 4007



'RENMIN RIBAO' COMMENTATOR'S ARTICLE DISCUSSES AFFORESTATION

HK280619 Beijing RENMIN RIBAO in Chinese 13 May 80 p 2

[Article by commentator: "The Responsibility System Must Be Enforced in Forest Renewal"]

[Text] There has been too much felling of trees and too little or no afforestation in China's forests. The cut areas cannot be renewed and plenty of land is wasted. There are even exposed rocks and soil erosion exists. This is one of the common longstanding, big and difficult problems in our forests.

Many forests cannot be renewed after felling. One of the most important reasons for this is that those previously engaged in reforestation "ate from the same pot." They had no definite duties and no fair rewards and punishments. As a result, nobody cared whether one was engaged in afforestation work and whether one did well in the work. Those who made great contributions toward maintaining a high survival rate of forests were not rewarded while those who caused great losses and barely managed to get a low survival rate of forests were not punished. Therefore, the staff's initiative in afforestation could not be mobilized.

The Culluan Forestry Bureau has enforced the "seven-fixed and five-contract reward and punishment" responsibility system to renew forests and has fundamentally solved this conflict. The bureau has defined the staff's afforestation responsibilities and given them fair rewards and punishments. It has considered the interests of the state, collective and staff and organically integrated the long-term fruits of afforestation with the immediate economic interests of the staff. Therefore, it has fully mobilized the staff's initiative to do more and better afforestation work. It has also brought along the staff's family members to take part in the work. As a result, the survival rate of trees has been higher, the conservation rate has been greatly increased and the cost of afforestation has been lowered. The bureau has also encouraged everyone to enthusiastically acquire the technical knowledge of tree growing, which is beneficial to the training of a Red and expert afforestation Army.

We must practice the system of personal responsibility to do a good job of industrial production. We must also practice various responsibility systems to make achievements in agricultural production. Since trees grow slowly and the production cycle is long, we must practice a strict fixed contract responsibility system of rewards and punishment in connection with the staff's economic interests.

The practical experiences of the Cuiyuan Forestry Bureau has fully proved that the fixed contract responsibility system of rewards and punishment is an effective economic method to manage forestry production. It has many advantages and can change the tendencies of overemphasizing tree felling and neglecting afforestation, of felling and no afforestation, and of an imbalance of felling and tree planting. It can also promote more and better afforestation in state-owned forests, rapidly renew cut areas and achieve greater, faster, better and more economical results in growing and developing forests. It is also a good way to organize the young people in forest regions to take part in productive work while they wait for employment.

The fixed contract responsibility system of rewards and punishment adopted by Cuiyuan Forestry Bureau to renew forests should be vigorously advocated and spread. This system can be enforced in state-owned or collective forests or in ordinary communes and production teams according to their own specific conditions. The afforestation work of our country will then be greatly accelerated and its quality improved. If we practice this responsibility system in nursing and managing trees until they grow into useful timber and in periodically checking on the quality of work and settling accounts, we will be able to guarantee the rapid growth and high yield of trees. In this way, we will have more flourishing forests and green hills for our use in China.

The state, collective and individuals must work together to rapidly restore and develop our forestry work. The state-owned forest enterprises must adopt the effective responsibility system to rapidly reforest the waste hills and land caused by insufficient renewal after the felling of trees in state-owned forests. The party committees of various localities where the collectives have not replanted barren hillsides and waste land and where the commune members' families have not planted trees must conscientiously implement the party's forestry policy and vigorously mobilize the masses to plant trees so that the motherland will be green.

CSO: 4007

'RENMIN RIBAO' ADVOCATES CONTRACT SYSTEM

HK300416 Beijing RENMIN RIBAO in Chinese 24 May 80 p 1

[Editorial: "Actively Popularize the Contract System"]

[Text] Hebei Province's Jin County has tried out the method of instituting a contract system in production, procurement, supply and marketing, and has improved leadership over agricultural production. This is a great reform in the management of the economy. The reform has attracted the attention of quarters concerned. At present the Jin County contract system is being popularized in some other Hebei counties. It is greatly welcomed by the cadres at the basic levels.

To employ the contract system is a good way for us to use economic means to manage agriculture and solve economic problems, and is an important reform in the system of economic management. By means of contracts, we can organize economic activities between enterprises and units, and define and harmonize the economic relations between them, so that both parties signatory to a contract enjoy economic equality and mutual benefit no matter whether they are units under ownership by the whole people or collective ownership, big units or small units. Both parties shoulder some economic responsibility. This method can stimulate our economic activities to conform to objective laws.

To manage modernized great industry, we must use the contract system, and to manage modernize great agriculture we must also use the contract system. At present, as collective ownership enterprises, the communes actually do not enjoy equal status with enterprises under ownership by the people. Many comrades are used to employing merely executive means to lead agriculture, and the self-management rights of the production teams cannot be guaranteed. The basic level cadres of communes and brigades are the direct managers of agricultural production, however, they are often ignorant of the agricultural and sideline products to be sold to the state and the production materials the state can supply. Thus it is very difficult to carry out planned management, and rationally arrange production. This affects their initiative and responsibility in management. By signing contracts, we can set

up equal economic relations between state enterprises and units on the one hand and the collective economy on the other. We can further improve the relationship between the state and the peasants. It is an important measure for continuously implementing the rural economic policies and speeding up the development of agricultural production.

Some comrades think that the agricultural contracts currently being signed are still not perfect and that their role is not great, thus they wonder if it is necessary to popularize the system. Indeed, the contract system at present is really not perfect enough. However, even this imperfect contract system has demonstrated its initial role in trial-implementation. For example: Supplies of some production materials are guaranteed, and there is a set base quota for grain procurement. The basic level cadres are very satisfied with the above benefits, which are helpful for mobilizing the initiative of the masses. Of course, there are not the only effects of popularizing contracts. Jin County has only tried it for a year. But the county CCP Committee has already started to get rid of administrative affairs, and can more seriously strengthen leadership over implementing economic policy, improving economic management, and carrying out scientific cultivation. There are definite changes in the blind management practices and purely quota viewpoint in the finance and trade system, which now offers better services for agricultural production.

In carrying out and popularizing the contract system we definitely will meet new problems. The key to whether or not we can persist in the contract system and continuously develop it to perfection lies in whether the CCP committees concerned can emancipate their minds, motivate their machines and continuously study new problems. If they are lazy in ideology, satisfied with the present situation, avoid contradictions, are afraid of struggle, and retreat whenever they meet problems, then it will be difficult to maintain the contract system. After a contract is signed, the communes and brigades will demand self-management rights, and the county CCP Committee leaders cannot manage by relying on old methods; if they go on issuing blind commands and treating everyone the same way regardless of local conditions, they will be boycotted by the basic level leaders. Thus they have to break away from old conventions in leadership ideology, change their leadership style and learn new leadership methods.

To carry out the contract system is the beginning of an important reform in economic management. So long as we seriously persist in it and continuously improve and augment it, there are sure to be changes beneficial to agricultural production in various aspects. The specific procedures in trial implementation carried out by the Jin County CCP Committee are not necessarily all correct, and they cannot suit the different situation in all places. However, their revolutionary spirit of initiative and serious practice must be promoted while popularizing the contract system.

PRC PRODUCES STANDARDIZED RICE TRANSPLANTERS

OW300239 Beijing XINHUA in English 0207 GMT 30 May 80

[Text] Beijing, 30 May (XINHUA)--China has begun serial production of a standardized rice transplanter, the Ministry of Agricultural Machinery announced here today.

More than 2,000 such transplanters have been turned out and put to use this year.

The new transplanter, driven by a 3-h.p. diesel engine, has nine specifications designed for different spacings between crop rows and for rice seedlings of various sized. These specifications are suitable for use in paddy fields in most parts of the country.

For each specification, the distance between the rice clusters in the same row can be adjusted. With attachments, the machine can also handled tender seedlings without soil around the roots, a new experiment in rice transplanting.

Of the component parts of the nine specifications, 85 per cent are interchangeable. To ensure quality, the parts, produced separately, are assembled at six farm machinery plants.

A technician of the agricultural machinery ministry says the rice transplanter is five times more efficient than transplanting by hand.

Designing the transplanter began at the end of 1977. Last year 300 models were turned out and tested throughout China. The final design was endorsed by a national meeting held in Shanghai last September.

Rice transplanters previously turned out in China were made in dozens of factories. They had no standardized parts, causing trouble in maintenance and repairs.

CSO: 4020

## THIRTY YEARS OF CLIMATOLOGY IN CHINA REVIEWED

Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese Vol 34 No 4,  
Dec 79 pp 294-304

[Article by Xu Shuying [1776 3219 5391] and Zheng Sizhong [6774 2448 0022]  
of the Institute of Geography, Chinese Academy of Sciences: "Thirty Years  
of Climatology in China"]

[Text] Since the founding of the nation, geographical work in New China has developed prosperously under the wise leadership of the party. This has greatly pushed forward the study of climatology in our nation. Climate is one of the natural phenomena that must be taken into consideration in many construction projects. The demand upon each production department to engage in the study of climate has become more and more urgent. Our nation's climatology realized more overall development in this new stage and many achievements have been made. In summarizing our nation's climatology of the past 30 years, achievements have been made in the following four major areas.

## 1. Studies in the Formation of Climates

Formation of climates is an important topic in climatological studies. Before Liberation, little work had been done in this regard. Since the founding of the nation, more work has been done in this area.

## 1. Studies Concerned with the Equilibrium of Heat and Water

The energy of atmospheric radiation is an important link in the intake and the output of atmospheric energy, and it serves an important function in atmospheric movement. Chen Longxun [7115 7127 8113] et al(1,2,3) and Li Yuhai [2621 3768 3189]<sup>(4)</sup> conducted a series of studies of the intake and output of the energy of atmospheric radiation in the troposphere over the East Asian area. In the East Asian region taken as an entire geoclimatic system, the amount of heat in July basically replenishes the loss of heat in January. But atmospherically speaking, the amount of loss of heat in January is greater than the amount of heat gained in July, and the



intake and output characteristics of various forms of heat of each locality in East Asia are not consistent. Zuo Dakang [1563 1129 1660] et al<sup>(5)</sup> calculated the equilibrium of atmospheric radiation and the distribution of its components, equilibrium of the geoclimatic system and equilibrium of atmospheric radiation and the distribution of its components over the East Asian region. The absorption of the energy of solar radiation by the atmosphere of the stratosphere was also studied.<sup>(6)</sup>

In studying the equilibrium of surface radiation of the earth, Yin Hong [1438 1347]<sup>(7)</sup> was the first to calculate the distribution of total radiation of our nation's eastern regions using records of sunshine at various localities. In the 1960's, Chen Jiansui [7115 1696 4840]<sup>(8)</sup> analyzed the characteristics of annual variation of total radiation. Zuo Dakang et al<sup>(9)</sup> determined the average latitudinal values of total monthly radiation under clear skies and derived the formula for computing the total monthly radiation from actually measured information on solar radiation, and drew a national distribution map of total monthly and yearly radiation values. Variation of the values of our nation's total yearly radiation is within the relatively large range of between 85 and 200 kilocalories/centimeters<sup>2</sup>. The value of yearly total radiation of the Qinghai-Xizang Plateau is the highest, followed by the south of Nanling and the north of the Huai River. The western part of the Xichuan Basin is a low value center. The rates of reflection by the ground surface were also analyzed and a national distribution map for January, April, July and October was drawn<sup>(10)</sup>. This provided the computational data of total solar radiation for the equilibrium equation of surface radiation, and it preliminarily determined the rate of surface reflection and the spatial distribution of effective radiation, and it was used to compute the equilibrium values of surface radiation.<sup>(11)</sup> Over our nation's expansive area, the variation of the average values of annual radiation is between 35 and 75 kilocalories/centimeters<sup>2</sup>, and the values increase as the latitudes drop. The equilibrium value of annual radiation of the river valley of the Yarlung Zangbo River is the highest, because the values of total annual radiation of the Xichuan Basin, northern Guizhou and the western parts of Hubei and Hunan are small, this region has become a region of low equilibrium values of radiation. In the 1970's, Gao Guodong [7559 0948 2767] et al<sup>(12)</sup> used more stations and longer series to calculate the equilibrium of surface radiation and the distribution of its components in the East Asian region and drew an even more detailed distribution map. In addition, Weng Duming [3040 4648 7686]<sup>(13)</sup> discussed the effect of solar radiation upon the formation of the annual course of change of temperatures in our nation. Some others discussed the relationship between total and dispersed solar radiation,<sup>(14)</sup> synoptic methods of calculating total radiation<sup>(15)</sup> and the relationship between total radiation and equilibrium of radiation.<sup>(16)</sup> All of these works are significant in determining each component of radiation equilibrium. Combining studies in radiation climatology with the reclamation of waste land in our nation's northeast has a definite practical significance. For example, transport of dust was explored by measuring the turbidity of meadow atmospheres<sup>(17)</sup> and the

effects of surface heat equilibrium over reclaimed land and grazing land upon the transport of dust was discussed etc.<sup>(18)</sup> Li Hualin [2621 2037 3866] et al<sup>(19)</sup> also studied the characteristics of the equilibrium of radiation during the emergence of late frost and freezing in the region north of the Huai River. Studies in the field of radiation began from nothing after Liberation to an area of work that has developed. At present, preliminary understanding has been acquired regarding the equilibrium of surface radiation and the characteristics of temporal and spatial distribution of its components. This is helpful in understanding the formation of our nation's climates.

The cycle of atmospheric moisture is an important link in the moisture cycle on earth. Wu Boxiong [0702 0130 7160]<sup>(20)</sup> was the first to analyze the content of water vapors in the atmosphere over our nation's continent. Zheng Sizhong et al<sup>(21)</sup> showed the clearly visible characteristics of the distribution and change of the content of water vapors in the atmosphere above our nation's continent resulting from the effects of East Asian monsoon activities by numerical computations using many years of data and contrasted the results with data of the northern hemisphere. Under average conditions over many years, the distribution of the differences in evaporation and rainfall of each part of the earth varies, and there must be a definite condition of transport of water vapor to balance it. Shen Jianzhu [3088 1696 2691] et al<sup>(22)</sup> utilized data of 1957 and computed and analyzed the transport of water vapor during the four seasons and throughout the entire year in the atmosphere above our nation's continent. The results showed that two water vapor currents are present in winter over our nation's continent, the northwest water vapor current and the southwest water vapor current. Three water vapor currents are present during summer, the southwest water vapor current, the southern or the southeast water vapor current and the northwest water vapor current. In addition, Xu Shuying [1776 3219 5391]<sup>(23)</sup> computed the transport of water vapor and moisture equilibrium over our nation's eastern part in January and July of 1956. Some others<sup>(24-26)</sup> have conducted analysis of individual cases. People disagree in their theories<sup>(22-24)</sup> about the question whether summer is the source of water vapor when our nation's eastern continent is regarded as a closed region. Computations of the convergence field of water vapors showed that water vapors converge over the Changjiang-Huai River valley region in summer, diverge over the south of Nanling and the north of the Yellow River, and the convergence zone of water vapors moves northward or southward seasonally.<sup>(27)</sup>

Fu Baopu [0265 2128 3877]<sup>(28)</sup> and Liao Rongsun [1675 2837 5549]<sup>(29)</sup> separately derived the computational formula for water vapor circulation in studying the question concerning the circulation of atmospheric moisture. Zheng Sizhong et al<sup>(30)</sup> calculated the circulation of atmospheric moisture of the Changjiang River Valley and showed the major source of rainfall over valley comes from water vapors foreign to the region. Wang Zuoshu [3769 0155 6615] et al<sup>(31)</sup> calculated the circulation of moisture above the upper



research of the Changjiang during the peak of summer of each year from many years of data and showed that the coefficient and the intensity of moisture circulation over this area are both relatively large, therefore it is believed that geographical environment importantly affects the conditions of moisture circulation. The writer concluded from this that measures of water conservancy and afforestation of this region will bring about a greater increase in the amount of rainfall. Zhu Gangkun [2612 1511 2492] et al<sup>(32)</sup> was the first to compute the maximum possible amount of evaporation based on the Poilcare formula. Recently, Gao Guodong et al<sup>(33)</sup> used Bothe's (Walter Wilhelm Georg Franz) summation principle to compute and chart the national distribution map for each month and the whole year. During the past 30 years, a lot of work has been done in studying the question concerning circulation of atmospheric moisture and a preliminary understanding of the source of water vapors and their activity in different seasons over our nation's continent has been gained.

## 2. Mutual Effects of the Ocean and the Atmosphere

As early as the 1930's, Lu Jiong [0712 3518] noticed the relationship between the drought and flooding in the Changjiang and Huai river valleys and the temperature of sea water and ocean ice<sup>(34-36)</sup>. Since the 1960's, they have discovered further connections between the cold and warm ocean currents and the increase and decrease of plum rains as well as the effects of the warm and cold ocean currents upon atmospheric circulation in East Asia.<sup>(37-39)</sup> Analysis showed that in damp years, the warm ocean current and the cold air current all intensify at the same time. This is beneficial to sustaining the plum rain front over the Changjiang River Valley. The opposite is not helpful to the front to sustain itself and to remain stationary over the Changjiang River Valley and drought occurs. Chang Piyuan [1728 0012 6678]<sup>(40)</sup> and Chen Enjiu [7115 1869 0036]<sup>(41)</sup> discussed the mutual effects between the ocean and the atmosphere from the point of view of energy exchange to study the mechanism of the effects of oceanic circulation upon atmospheric circulation. The results showed that the scope and intensity of evaporation from the ocean surface and the manifestation of heat over the northern Pacific during the dry season are visibly different from those during the damp season. When the subtropical high pressure ridge intensifies and moves northward, the manifestation of heat transported from the ocean to the atmosphere increases and the range also expands. In the opposite situation, the manifestation of heat transported to the atmosphere decreased and the range withdraws southward. Li Kerang [2621 0344 6245]<sup>(42)</sup> showed in his study of the characteristics in the properties of heat equilibrium over land and over the ocean. Among the various factors affecting the exchange of energy between the ocean and the atmosphere, the direction of approach and the wind velocity are the factors that have decisive effects, i.e., conditions of atmospheric circulation.

Since the 1960's, Britain, the United States, Japan and the Soviet Union have noticed the effects of ocean temperatures and ocean temperature anomalies upon synoptic climates or the reaction of ocean temperatures to the function of atmospheric feedback. During these years, our nation's climatological workers have been attempting to draw a connection between the variations in temperature of sea water and rainfall over our nation's eastern region.<sup>(43-45)</sup> Gui Peilan [2981 0160 5695]<sup>(46)</sup>, Lin Xuezhong [2651 1331 2867]<sup>(47,48)</sup> and Zhang Yan [4545 3238] et al<sup>(49)</sup> analyzed the types of distribution of ocean surface temperatures of the north Pacific and their corresponding relationship with the circulation in East Asia. Chen Lieting [7115 3525 1656]<sup>(50)</sup> also drew a connection between anomalies of the ocean of global synoptic scales and anomalies of atmospheric circulation. Some others emphasized the study of the relationship between tropical ocean temperatures and the subhigh over the western Pacific based on the analysis of long-term evolution of ocean temperatures of the Pacific.<sup>(51-53)</sup> For example, it was discovered from separate energy spectrum analysis of the two sets of time series of the intensities of the entire subhigh and the anomalies of tropical ocean temperatures of each month over the years that three types of very close oscillation periods exist between the two. The major oscillation cycle is the long cycle of 3.5 years. This showed that a close relationship exists between the two and both are in the same oscillation system. The change in the subhigh lags behind the change in ocean temperatures by 1 to 2 quarters. The discovery of this time lag effect on the mutual effects of ocean and atmosphere serves a definite function in the long range forecasting of subtropical high pressure systems.

Because of the discovery of the El Niño phenomenon in recent years, some people have hypothesized the existence of a "remote relationship" between anomalies of ocean temperatures in the Equatorial zone and atmospheric circulation at middle and high altitudes. Pan Yihang [3382 1837 5300]<sup>(56)</sup> studied the phenomenon of the weakening of northward transport of water vapors from the central Pacific resulting from an intensification of latitudinal circulation when the ocean surface temperature of the eastern Pacific in the Equatorial zone is colder than normal years. In the opposite situation, longitudinal transport of water vapors intensifies, and the angular momentum zones which are found more at low latitudes are brought to the subtropical zone and even to the regions of mid-latitudes. Fu Congbin [4569 3222 2430] et al<sup>(57)</sup> used actually measured wind data and calculated the average latitudinal circulation near the Equator when anomalous warming and cooling over a large ocean area of the Equator occur. The mechanism of the mutual effects of these two perpendicular circulations upon the long range variation of the subtropical high pressure system was derived. Analysis also pointed out that variation in the atmospheric temperature field reacts visibly to Equatorial ocean temperatures,<sup>(58)</sup> and this kind of influence is expanded to the subtropical zone. Then, via the adaptation of the subtropical atmospheric altitude field to the temperature field, it affects the variation in intensity of the subtropical high pressure system. This indicated that the tropical ocean exerts an

outstanding effect in the formation of climates. Although the above studies have only begun, continuous discovery of facts and further theoretical analysis will help the development of long range synoptic forecast which is at the same time a fundamental question in the theory of formation of climates.

### 3. Monsoon Climate of East Asia

In recent years, the question of monsoons has received popular attention by climatological workers of the world's nations. In the past, many people have studied the causes of the formation of monsoons from different angles. In the 1950's, Gao Youxi [7559 3945 4406] et al<sup>(59,60)</sup> had begun to discuss the question of the formation of the monsoon climate in East Asia. They pointed out in their discussion of the effects of the distribution of sea and land upon climate that the relative size of sea and land and their relative latitudinal positions as well as the differences related to whether the sea and the land are in the north and south hemispheres or the east and west hemispheres should be emphasized. The effect of the distribution of sea and land upon climate can only be understood against this broad background. It was also pointed out at the same time that even though the area of the Qinghai-Xizhang Plateau does not constitute a large proportion of the area of the Asian-European-African continent, but because of its locality in the subtropical zone, its heating and kinetic effects are very outstanding. Therefore, in the formation of the climate of East Asia, especially in the formation of the South Asian monsoon and the north and south exchange of air over the Indian Ocean, the Qinghai-Xizhang Plateau exerts a very important effect. Analysis also showed the effect of the continent changes seasonally and by latitude. The effect of the continent at low latitudes is most obvious in summer and the effect of the continent at high latitudes is most obvious in winter. In winter, a cold high pressure system is formed over the Eurasian continent and in the upper layer of the troposphere there is a corresponding low pressure trough. The opposite occurs over the Pacific. In summer, a hot low pressure system is formed over the Afroasian continent and in the upper part of the troposphere there is a corresponding Qinghai-Xizhang high pressure system. The opposite occurs over the Pacific. A Pacific high pressure system is present in the lower layer of the troposphere and a low trough is present at high altitudes.

The world's highest and largest Qinghai-Xizhang Plateau is in the western part of our nation. The heating conditions between the plateau and its surrounding free atmosphere undergo similar seasonal change like the conditions of heating between the ocean and land. Thus, the monsoon phenomenon also occurs over the plateau.<sup>(61)</sup> Tang Maocang [3282 2021 5547]<sup>(62)</sup> pointed out that the monsoons of the plateau are different from the monsoons of the ocean and land and the Indian monsoons. This point was echoed similarly in the view of Zhang Jiacheng [1728 1367 6134]<sup>(63)</sup> in his discussion of several questions concerning the nature of monsoons. Yet, a very important interaction exists between the monsoons of the plateau and monsoons of the sea and land. The monsoons of the plateau have intensified and expanded the range and the advancing and retreating velocities of winter and summer monsoon activities over our nation's eastern regions.

Some have more systematically studied the relationship between the advance and the retreat of monsoons and the northward and southward shifts of the rain belt of our nation.(64-69) The shifting process of our nation's rain belt involves three forward leaps and three gradual retreats. Thus, the beginning and the end of the rainy season can be determined by the dates of the back and forth movements of the rain belt. Also, the advance and retreat of monsoons are also closely related to the seasonal change of atmospheric circulation(70) and our nation's seasons.(71) Natural seasonal changes have been determined by the evolution of the comprehensive synoptic types(72) as well as classified by types of circulation of natural synoptic cycles of East Asia.(73,74) Because of the different ways of observing and the use of different indicators, the beginning and the ending dates of the seasons are not consistent, but generally are not far apart. Some have conducted synoptic climatological studies of the periods of transformation of winter and summer monsoons such as from spring monsoons to summer monsoons(76) or from summer monsoons to winter monsoons(77) and of the situation of peak summer circulation,(78) based on determining the advance or regression of the dates of the monsoons.(75)

At the beginning of the 1960's, Xu Shuying et al(79) pointed out in their analysis of the characteristics of the South Asian circulation during the peak period of summer monsoons that during the peak period of summer monsoon activity, the type of circulation near the tropopause undergoes a visible change. A warm high pressure system is formed at 100 millibars and a hot low pressure system forms at 850 millibars. This change is a seasonal change over the northern hemisphere and is most visible over South Asia. Strong easterly winds emerge at high altitudes and summer monsoons begin at low altitudes. Guo Qiyun [6753 0366 5686](80) showed in his study of the effect of circulation of the southern hemisphere upon the development of summer monsoons of our nation that each year, 1 to 2 climates before the visible development of the continental low pressure system, correspondingly strong cold air activity emerges in the area from Australia to the south Pacific. The visible change in the high pressure ridge of the western Pacific is related to the strength or weakness of the activity of the cold air. Although people had theorized in the 1920's that the southwest monsoon comes from the southern hemisphere, this theory was not given emphasis by people until the end of the 1960's when the low altitude jet streams coming from the southern hemisphere were discovered. Recently, Chen Longxun et al(81) analyzed them and found three air currents that cross over the Equator and enter over our nation's South Sea and the western Pacific. This provides a further understanding of the formation of summer monsoon circulation.

In studying the differences and the similarities between the circulations of the low latitude monsoon regions and nonmonsoon regions,(82-83) Yang Jinxi [2799 6855 6932](84) also calculated the average longitudinal circulation in the peak monsoon regions and the off-peak monsoon regions. In the peak monsoon regions, the lowering and divergence of the cold high pressure system over the continent in winter intensify the normal circulation at low altitudes (northerly wind in the lower layers and southerly



wind in the higher layers) and the circulation is much stronger than that in the off-peak regions and its area is wider. In summer, a monsoon circulation flowing in the opposite direction as the normal circulation at low altitudes emerges while a normal circulation is maintained in the off-peak monsoon region. When these are compared with the average longitudinal circulation in summer over the Qinghai-Xizhang Plateau, it can be seen that there is a strong monsoon longitudinal circulation over the plateau. This longitudinal circulation is much stronger than the average longitudinal circulation in the monsoon peak region.<sup>(85)</sup> This further indicated that the heating effect of the Qinghai-Xizhang Plateau not only connects the monsoon circulations of high and low altitudes together but also connects the atmospheric circulations of the north and south hemisphere together. Therefore, the difference in heating by the sea and by land is the most fundamental reason for the formation of monsoons. The effect of topography has a greater influence upon the regional characteristics of monsoon phenomena. The heating effect of the Qinghai-Xizhang Plateau also influences the interaction of the circulations of the southern and the northern hemisphere. All of these combine and result in the formation of our nation's monsoon climate. Recently, some people have explored the various fields of monsoon climatology, synoptics, kinetics and experimental numerical models. Their work has helped in the further understanding of the formation of monsoon climate of East Asia.

## II. Changes in Climate

Our country has a long history. Historical documents contain a wealth of past climate records. Since the founding of the nation, the broad masses of geographical and water conservancy workers and the literature and history departments have all massively collected and compiled records related to climate in historical documents to meet the need of industrial and agricultural development. Xu Jinzhi [1776 6602 0037] first compiled a book on the large and serious drought, floods and natural disasters that have occurred in history in each province, city and autonomous region in the Yellow River, Huai River and Changjiang valleys from regional records.

The validity of the records on climate in historical documents is worth attention. Zhu Kezhen<sup>(86)</sup> was the first to notice this problem. He believed that "we should be critically selective towards historical records." At the same time he is critical of those who believe historical records of the number of disasters etc "are a bunch of muddled records" and believes "that this attitude at least is not serious enough." Jiang Delong [5592 1795 7127] et al<sup>(87)</sup> compared Shanghai's meteorological data with the record of floods and droughts in the local historical documents and concluded that "records in historical documents are factual but there are still missing gaps." In addition, some people<sup>(88)</sup> have made similar comparisons and believe as long as indicators are used. A definite number of records of floods and droughts in history obtained by statistical induction can to a relatively high degree reflect truthfully the variation in the conditions of dampness in history. Using the recorded word to analyze historical climates will encounter the problem of a lack of standards for flooding

and drought or cold and warm conditions or problems with a lack of indicators. Analysis of historical climates since the 1970's has paid more attention to this problem. Tang Zhongxin [3282 0112 9515]<sup>(8c)</sup> used the method of "the three digit number series for annual rainfall" to classify drought and floods in analyzing the historical floods and drought in Baoding. It is a more objective method. Zheng Sizhong et al<sup>(8)</sup> started out from probability and statistics and proposed a kind of "dampness index for historical climates" as indicators of flooding and drought. This method can avoid some traditional shortcomings in historical records.

Beginning in 1975, compilation work on "a drought and flood distribution map over the past 500 years throughout the nation" was organized with the participation of many units throughout the whole nation. In the first phase in 1975, a "distribution map of drought and floods of the past 500 years in north China and the northeast" was completed under the cooperation of the Research Institute of the Central Meteorological Bureau, Geophysics Department of the Beijing University, and the meteorological bureaus of 10 provinces (cities and autonomous regions) of the northeast and north China. In the second phase in 1977, a "national distribution map of floods and drought over the past 500 years" was drawn. This map, which included the work of the first phase, was based on the compilation of historical information on droughts and floods by 19 provinces (cities, autonomous regions) of the northwest, southwest, southern central and eastern China organized in cooperation with the Changpan hydrography department, the Geography Institute of the Chinese Academy of Sciences and the Jiangsu Provincial Geography Institute and under the sponsorship of the Meteorology Department of Nanjing University. The work was directed by the Research Institute of the Central Meteorological Bureau. In the atlas, flood and drought conditions were differentiated by a scale of 5: level 1 (waterlogged), level 2 (partially waterlogged), level 3 (normal), level 4 (partial drought), and level 5 (drought). The standard for the five-level classification corresponds to the typical condition described in regional records. In evaluating the levels, conditions of the three seasons of spring, summer and autumn are taken into consideration and especially of summer which is the major season. The atlas spans the years from 1470 to 1977, one map for 1 year, a total of 508 maps. This is an achievement that mobilized the efforts of many units within the nation. The atlas basically describes the distribution of drought and floods of the past 500 years in our nation year by year. The shortcoming is the information on the western regions was scarce and many blanks are left for the early years. These will be supplemented in the future.

The study of changes in climate also involves analysis of spores and pollen and analysis of annual rings of trees. Wang Kaifa [3769 7030 4099] et al<sup>(90)</sup> analyzed the changes in climate over the past 6,000 years by studying the spores and pollen found in the cultural layer of the ruins of the Shanghai region. Since the 1970's, some studies exploring the relationship between climate and the annual rings of trees in provinces (autonomous regions) having favorable conditions such as Heilongjiang, Jilin, Xinjiang, Shaanxi, Hunan, Guizhou and Yunnan were done and experiences have been preliminarily gained.<sup>(91,92)</sup>

Zhu Kezhen [4555 0668 2823]<sup>(93)</sup> analyzed the history of the changes in temperature over the past 5,000 years by studying uncovered archaeological material, phenological records in historical books, regional records and materials and observational and measured records of instruments in the field of our nation's climatological history. He concluded that in the first 2,000 years of the past 5,000-year period, the annual average temperature for most of the time was 2°C higher than the present and the temperature in January was about 3°C to 5°C higher than the present. Afterwards, the lowest temperatures occurred in 100 B.C., 400 A.D., 1200 A.D. and 1700 A.D. The sway of temperature ranged between 1°C and 2°C. Chang Fuchun [1728 1381 2504] et al<sup>(94)</sup> analyzed the loss of oranges due to freezing and the southern boundary of closing of rivers by ice over the past 500 years. In the analysis of climate in historical periods, most of the work is being done in the analysis of drought and floods. As early as the 1960's, Tang Xiren [0781 6932 0088] et al<sup>(95)</sup> analyzed the aridity and drought during the Ming and Manchu dynasties in Hebei Province, Xiao Tingkui [5135 1694 1145] et al<sup>(96)</sup> analyzed the aridity and drought during the Yuan, Ming and Manchu dynasties in Henan Province, Qiao Shengxi [0829 4141 6007]<sup>(97)</sup> studied the question of flooding and drought in the history of Hubei Province. In the 1970's, the flood and drought conditions of the past 2,000 years in our nation's southeastern region were analyzed<sup>(88,98)</sup>. He Dazhang [0149 1129 4545] et al<sup>(99)</sup> analyzed the natural disasters of floods, drought, winds and freezing spells in the history of Guangdong Province. Generally speaking, the points of emphasis of the analysis of floods and drought in history during the 1960's and the 1970's are different. In the 1960's, analysis emphasized spatial changes. In the 1970's, emphasis was on temporal changes. Wu Xiangding [0702 4382 1353] et al<sup>(100)</sup> analyzed the changes in climate over the past several hundred years in the Xizhang region by studying the changes of natural phenomena and by analyzing spores and pollen and annual rings of trees. Gong Gaofa [7895 7559 3127] et al<sup>(101)</sup> analyzed the changes in the climate since the 17th century in Heilongjiang by studying records of historical documents, annual rings of trees and changes in the water level of lakes and inland seas and he showed that there were climatic oscillations.

A series of studies was completed during the 1960's on modern climatic oscillations of the past 100 years since meteorological records were kept. Wang Shaowu [3769 4801 2976]<sup>(102)</sup> showed in his analysis of climatic oscillations of Shanghai that the differences in oscillations in different months of the same element were very great, and the oscillations of different elements within the same month were not consistent. These indicated that the process of formation of climatic oscillations is very complex. Duan Yuewei [3008 2588 5633]<sup>(103)</sup> pointed out that the trends of change in temperature for many years at each region of the northern hemisphere have not been consistent. The various cycles of climatic oscillations within a 100-year period have been found. Among the cycles, more cycles of 2 to 3 years, 11 years, 22 years and a century have occurred<sup>(104-106)</sup>.

The authors have connected the cycles of 11 years and 22 years with the cycles of solar activity. Peng Gongbing [1756 0361 3521] discovered in his studies of the effect of polar shift upon changes in climate that in many climate series of our nation, cycles of 6 to 7 years and 35 years consistent with the "comprehensive polar shift amplitude cycles" exist.

Since the 1970's, a lot of work has been done on a trial basis in climate forecasting. Zhang Jiacheng<sup>(107)</sup> classified climate forecasting into four large types. In one of his other articles,<sup>(108)</sup> he derived the general trend in climate in our nation up to the year 2000 by studying the relationship between solar activity and the characteristics of the change in climate in this century and between solar activity and four occurrences of change in climate to a colder climate over the past 500 years in our nation.

### III. Microclimatology and Agroclimatology

After Liberation, as the national economy developed, industrial and agricultural production presented many questions to and demands upon climatology. Many of these were problems in microclimatology. Microclimatology thus came into existence from nothing and developed in our nation.

During the beginning period of the founding of the nation, the young rubber trees in the subtropical regions of south China were not growing well and natural disasters such as wind, cold and drought existed. In the spring of 1954, the South China Work Team of the Chinese Academy of Sciences joined the Tropical Forest Institute and conducted surveys and studies on planting a protective forest. Between 1954 and 1957, observations of the microclimate of the protective forest belt in the south China rubber plantations were made. The massive amount of comparative, observed and measured data coupled with information on the growth of crops and the damage due to natural disasters have provided a preliminary understanding of the effect of wind breaking and prevention of drought by the forest belt and the effect of the forest belt in protecting the young rubber trees from cold. Suggestions concerning the design of future forest belts in that region were made.<sup>(109)</sup> Lu Jiong<sup>(110)</sup> investigated frost and freezing in the tropical zone and summarized the relationship between topography and frost and freezing. This served an active function in the planting of tropical crops in southern China. In addition, Huang Runben [7806 3387 2609<sup>(111)</sup>] and Liu Senyuan [0491 2773 0337]<sup>(112)</sup> et al analyzed heat equilibrium of the ground surface in Guangdong according to the need in the development of tropical crops.

In the summer of 1956, the Meteorological Department of the Nanjing University cooperated with the Agrometeorological Group of the former North China Agricultural Science Institute and joined the combined investigation team sponsored by the Chinese Academy of Sciences to study water and soil conservation in the middle reaches of the Yellow River. Under the



guidance of Yao Zhensheng [8010 2650 3932],<sup>(113)</sup> the effects of microclimates of the various measures to preserve water and soil and of different topography and various vegetative layers of the loess plateau of the northwest were surveyed. The work was done rather comprehensively.

There are even more microclimatological topics in the work of controlling our nation's northwestern desert. Geng Kuanhong [5105 1401 1347]<sup>(114)</sup> summarized the relationship between the genesis of sandy winds and shifting sand by combining field examinations and observations of microclimates with information on climates. He also drew a distribution map of the various characteristics of the climates of sandy winds in the arid regions of the northwest. Work in this aspect is meaningful in the management of deserts.

Fu Baopu<sup>(115-117)</sup> has done a lot of work in microclimates in undulating topography. He expounded the conditions of heat, moisture and wind in undulating topography and studied problems concerning the theoretical calculation of each component of equilibrium of radiation in various regular undulating topographies. A lot of work has also been done in the study of microclimates in farmland. Lu Qiyao [4151 0366 1031]<sup>(118)</sup> expounded the microclimatic conditions of irrigated land via irrigation experiments. Fu Baopu<sup>(119)</sup> analyzed the differences in microclimates resulting from the dense planting of agricultural crops. He pointed out that light intensity, the degree of moisture of the soil, the relative humidity of the air, the velocity of wind in crop fields all change according to planting density following logarithmic, linear and index patterns. Each kind of crop has its most suitable planting density.

The climate exerts an important influence upon agriculture, especially in such a country like ours which is affected by monsoons. Zhu Kezhen's article "on the relationship between the several characteristics of our nation's climate and the production of food grain crops"<sup>(120)</sup> evaluated our nation's climatic resources from the point of view of agricultural production and pointed out some problems worthy of attention in our nation's development of food grain production. The article received widespread attention from people of various circles.

After Liberation, it has become necessary to evaluate our nation's resources of agricultural climates, to zone agroclimatic regions, to fully utilize climatic resources to meet the needs of the national economy and natural conditions of various localities. Yao Zhensheng<sup>(121)</sup> calculated and analyzed the conditions of heat in our nation's agroclimates. In addition, the agroclimates of some regions of our nation have also been analyzed by others.<sup>(122-124)</sup> Lu Qiyao et al drew an "atlas of China's agroclimatic resources" using all possible information on climates in our nation up to 1956. The atlas includes the distribution maps of the average values over many years of major agroclimatic indicators such as frost and freezing characteristics, wintering conditions, moisture assurance, and agroclimatic heat resources. This atlas basically summarized all the information of climate of the time and served agriculture.

At the beginning of the 1960's, many provinces (autonomous regions) implemented zoning of agroclimatic regions. Qiu Baojian [8002 1405 0404] et al (125) zoned our nation's tropical and subtropical zones into agroclimatic regions. In 1964, at the national agroclimatic zoning work conference, Feng Xiuzao [7458 4423 5670] et al evaluated the 16 provincial (autonomous region) level agroclimatic zones completed at the time, and they proposed several problems for discussion. The writers proposed questions concerning the concept of agroclimatic zoning. This meant that zoning of agroclimatic regions should be regarded as a kind of specific discipline in zoning of climatic regions and the discipline should have its own objectives. In all regions where zoning has been done relatively well, the indicators used all took into consideration to varying degrees their agricultural significance in those provinces (autonomous regions). At the same time it was pointed out that from the point of view of agroclimatic zoning proposed at this conference, it is important to first do the work in identification of agricultural climates well in order to do the work in agroclimatic zoning well. This is the basis of zoning. Although a lot of work has been done in this regard (126), this is still the weak link even today.

Zhu Kezhen and Wan Minwei [1354 2404 3262] collaborated on a book on phenology<sup>(127)</sup> in the study of phenology and used easily understood language to provide a general introduction to phenology. In 1962, under the guidance of Zhu Kezhen, the Geography Institute, Botany Institute of the Chinese Academy of Sciences and the Beijing Botanical Gardens and Animal Institute jointly organized and initiated the national phenological observation network. Constant observation of many aspects of animals and plants was set up and an annual report on phenological observations was published.

Phenological changes in our nation have been studied and analyzed by Wan Minwei et al and some patterns have been preliminarily discovered. Generally speaking, in the eastern plains, such as in the most widely distributed region of the beginning flowering period of weeping willow, an average delay of 2 to 3 days occurs for each degree of deviation northward in latitude. Recently, Wan Minwei et al wrote a book entitled "The Method of Phenological Observation in China"<sup>(128)</sup> on the basis of the draft of the original method of observation and the experience accumulated from observation over many years. The book describes in detail the significance of phenological observation and its various applications, the method of phenological observation presently used in our nation and contains a pictorial collection of phenologically observed plants and animals. It will help the development of phenological observation work of mass character.

#### IV. Studying the Characteristics of Climates and Zoning of Climates

During the past 30 years, many significant studies were made in the characteristics of our nation's climate and zoning of climates. Work in the following aspects will be introduced here.

## 1. Studying Our Nation's Climatic Characteristics

The characteristic of our nation's climate is visible seasonal variations. It is dry and cold in winter and damp and hot in summer. Rainfall is concentrated and the distribution of regions of rain follows a regular pattern. But annual variation in the time of advance and retreat, strength and persistence of summer and winter monsoons exists. And abnormally cold, warm, dry and waterlogged phenomena occur in some regions.

At the beginning period of the founding of the nation, Liu Enlan [0491 1869 5695]<sup>(129)</sup>, Zhu Binghai [2612 3521 3189]<sup>(130)</sup> and Yao Zhensheng<sup>(131)</sup> connected the discussion of the rate of change of rainfall over our nation with problems of drought and floods in questions concerning rainfall, drought and floods. Zhang Xiangong [1728 0341 1872] et al<sup>(132)</sup> studied abnormalities in rainfall over large areas from the monthly rainfall maps over our nation for the past 60 years. Lu Jiong et al<sup>(133)</sup> studied the types of floods and drought. Chen Shixun [7115 0013 6064]<sup>(134)</sup> studied some characteristics of rainfall in southern China. Xu Shuying<sup>(135)</sup> studied the floods and drought of the Yellow River valley. The Central Meteorological Bureau and concerned water conservancy departments studied in detail the flood and drought characteristics of the Huai River and the Hai River valleys. Xu Qun [1776 5028]<sup>(105)</sup> analyzed the plum rains over the lower reaches of the Changjiang over the past 80 years, and classified plum rains into two types, the early plum rains and the typical plum rains. Early plum rain is a kind of process of northward jump of an abnormal rain belt. It was pointed out at the same time that the annual variation of the plum rain period is great.

Jao Shiyan [7118 6108 6056] et al<sup>(136,137)</sup> analyzed the characteristics of circulation that form drought and waterlogging in years of big floods and severe drought. The results showed that in periods when drought and waterlogging persist in the Changjiang and Huai river valleys, the stability of the type of circulation over the subtropical and mid-latitude regions is great.

In years of big floods, seasonal change in atmospheric circulation is delayed 1 month. Some people<sup>(138)</sup> have pointed out in their study of the changes in the atmospheric activity center of the northern hemisphere in the 16 years of severe floods and drought in the Changjiang and Huai river valleys in summer since 1900 that during the periods of flooding and drought, the intensities of summer are visibly different, and prewinter and prepring winter monsoons are also visibly different. Chang Jiacheng et al<sup>(139)</sup> discovered in their analysis of flood and drought conditions of the middle and lower reaches of the Changjiang that the occurrence of drought and waterlogging is closely related to the characteristics of circulation. Some other people<sup>(140-141)</sup> studied and discovered that the conditions of circulation during the period of drought and waterlogging and the period prior to such occurrences at different localities are all visibly different. These have provided a basis for the formation of our nation's dry and

waterlogged climates. In recent years, methods of mathematical statistics have been introduced into climatological studies. Yao Zhenaneng, (144,145) first discussed the various computational methods of probability, and computed the general probability of rainfall, random variation of dry and wet days and the probabilities of wet periods, dry periods and the cycles of dry and wet climates. Guo Qiyun et al (146) used the empirical normal functions and objectively analyzed the seasonal changes of rainfall over our nation's eastern regions and the types of rainfall. The results showed that the first 3 to 5 terms of characteristic vectors in the expansion of the natural normal function is symbolic in climatology.

Analysis of conditions of circulation during persistently cold and warm periods in winter over a large area in our nation related to questions concerning temperature, cold and warmth showed that cold periods occur mostly within the several climates in which the westerly wind index of the eastern hemisphere gradually increases from its smallest value. Warm periods mostly occur within the latter half-period when the index remains persistently high. (147) Yao Zhensheng (148) used harmonic wave analysis to study the annual temperature changes at each locality of our nation. Lu Yurong [7120 3254 5554] (149) analyzed the temperature conditions in the regions of the middle and lower reaches of the Changjiang. Weng Duming et al (150) discussed the accuracy of the average values of temperatures and obtained the error of the average values and the empirical formula for obtaining the averages. Lin Zhiguang [2651 0037 0342] studied the climatic characteristics of low temperatures in the northeast. (151)

Zhang Hual [1728 3332] et al (152) proposed a classification of paths and frequencies of anticyclones of East Asia. Wang Ronghua [3769 2837 5478] (153) utilized ground surface synoptic maps and drew the paths of low pressure systems of the temperate zone in East Asia. Zhu Ruizhao [2612 3843 0340] (154) computed the frequency of occurrence of fronts. Peng Gongbing (155) studied the patterns of genesis and development of the low pressure systems over the East Sea and over the northeast.

## 2. Atlas of Climates and Regional Climates

At the beginning period of the founding of the nation, the first and second volumes of "The Climatic Atlas of China" was published in 1953 and 1955 respectively upon the basis of climatic information. At present, the Central Meteorological Bureau is preparing for publication the "Climatic Atlas of the People's Republic of China," utilizing information provided by 700 to 1,000 meteorological stations throughout the nation between 1950 and 1970. It has a total of 22 maps classified into 10 groups under the heading of barometric pressure, sunshine, solar radiation, atmospheric temperature, humidity, rainfall, wind, clouds, synoptic phenomena and climatic zones. It is a relatively overall and comprehensive basic climatic atlas to be published since the founding of the nation. Each province has also compiled its own provincial climatic atlas.



The Central Meteorological Bureau published a "High Altitude Climatic Atlas of China"<sup>(156)</sup> in 1973. It included the average altitude, temperature and the differences between temperature and dew point, specific humidity and the average windfield at each altitude on each isobaric plane. This has provided the condition for the study of high altitude climates in China.

Gao Youxi et al<sup>(157)</sup> systematically compiled a map of typhoon paths over the southwest Pacific for the 70 years prior to 1955 from historical information on typhoons. Some other units also systematically compiled maps of typhoon paths since the founding of the nation. The Geography Institute of the Chinese Academy of Sciences cooperated with concerned units, collected and compiled hydrometeorologic records for the regions within China's territorial seas and southwest Pacific. The information was illustrated in an atlas. In addition to ordinary climatic maps there is also a map on ocean waves. On the basis of this atlas, "Climates of China's Seas and Territorial Seas" was compiled and an "Atlas of Heat Equilibrium over Bohai, the Yellow Sea and the East Sea"<sup>(158)</sup> was drawn. These have provided the basis for studying the climates of our nation's neighboring seas.

Since the founding of the nation, the number of written works on regional climates of each administrative region, province and city has been huge. Other works were written according to natural geographical regions. The meteorological bureaus of each province, city and autonomous region have also compiled records of climates of their locality. These records of climates have all described in detail the various factors that form climates such as an analysis of circulation, radiation and natural geographical conditions as well as descriptions of temperature, rainfall, evaporation, wind and clouds. Some also have combined the demands of various professions and have provided special indicators for the concrete analysis of climatic conditions. Since the 1970's, meteorological departments at all levels have launched climatic surveys of mass character and on varying scales. Survey results were made into climatic maps and climatic records of provinces, regions and counties. This has contributed to the full utilization of climatic resources and the exposure of advantageous and disadvantageous climatic conditions.

In addition, in combination with the needs of various sectors such as engineering construction, medicine and public health, a wealth of achievements have been made in the study of applied climatology.<sup>(159)</sup> In our nation, applied climatology is emerging from nonexistence into an independent academic branch.

### 3. Climatic Zones

After establishment of new China, climatological workers launched studies related to climatic zoning from various approaches<sup>(160-163)</sup>. These have provided clues and references for our nation's climatic zoning. Later,

under the leadership of Zhu Keshen and the working committee on natural zoning of the Chinese Academy of Sciences, Zhang Baokun [1728 1405 1024] et al proposed a draft of China's climatic zones. On the basis of this draft, a first draft of "China's Climatic Zones" was written. This is a scientific basis necessary for the long range planning of production and construction of agriculture, forestry, animal husbandry and water conservancy. The method of zoning is mainly based upon heat, moisture and light. First level zones are indicated by the degree of dryness. Zoning of second level zones mainly took into consideration the amount of heat (cumulative temperatures or the atmospheric temperature of the coldest climate). Third level zones use the degree of dryness of seasons and years, annual amount of rainfall, cumulative temperatures, the number of hours of sunshine of the four seasons and the year as limiting factors. This has established the foundation of our nation's climatic zoning.

Qian Jiliang [6929 4764 5328] et al<sup>(164)</sup> and Lu Qiyao<sup>(165)</sup> almost simultaneously developed our nation's study of regions of dry and damp climates. Qian Jiliang applied the empirical formula of Poincare and used the degree of dryness and the frequency of dryness and dampness as zonal indicators. Lu Qiyao used the (Sashecault) formula to supplement and correct the results. The dates of occurrence and the number of days of persistence of the dry and damp periods of our nation were analyzed from the viewpoint of agroclimatology and moisture equilibrium, and dry and damp regions were zoned. Zhou Yufu [0719 3768 1318] et al<sup>(166)</sup> zoned rainfall regions according to rainfall characteristics and the similarity of the processes of annual variation.

### Concluding Remarks

In the 30 years since the founding of the nation, many achievements have been made in our nation's climatological research. Climatology is an ancient science. This science is presently developing towards the study of the formation of climates and the causes and mechanisms of variation of climates. These are the directions in which we should exert our efforts. We must study further to find methods and ways to reform and control climates on the basis of exploring the patterns of formation of climates. In the new long march towards the four modernizations under the leadership of the party from now on, we are confident that we can elevate climatology to a higher level.

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## SCIENTIFIC REPORTS ON AGRICULTURE HEARD IN ANHUI

Beijing RENMIN RIBAO in Chinese 19 May 80 p 3

[Article: "Rely on Science and Technology to Speed Agricultural Development"]

[Excerpt] Standing Committee of Anhui Provincial Committee Gives Serious Hearing to Special Survey Reports by Scientific and Technical Workers

Recently three meetings of the standing committee of the Anhui Provincial Committee, CCP, were held to give a serious hearing to special survey reports on major problems of agricultural production and construction throughout the province, given by scientific and technical workers. The five reports made on these occasions were: "Some Problems of Steady, High Agricultural Yields in the Pishihang Irrigation Area"; "Some Questions of the Agricultural Economic Structure and Production Distribution of the Pishihang Irrigation Area"; "A Comprehensive Survey Report on the Construction of a Commodity Grain Base North of the Huai River"; "An Approach and Specific Measures for Rectification of the Cultivation System Throughout the Province"; and "Accelerated Development of Fish Farming Production." These reports were the result of penetrating surveys and research by the scientific and technical personnel; they offered plentiful scientific data and were formulated after enthusiastic discussion. For example, the report on developing a commodity grain base north of the Huai was drawn up at the end of last year by the Comprehensive Survey Group on Developing a Commodity Grain Base North of the Huai, consisting of more than 100 specialists from the provincial agricultural institute and its component institutes of crops, soil, plant production, sericulture, horticulture, and livestock raising and veterinary medicine, together with the institutes of forestry, aquatic products, meteorology, water conservancy, hydrogeology, agricultural machinery, geography, and coal, as well as the relevant institutes from Fuyang and Su counties. Pertinent investigations were made in many disciplines, and a 16-chapter special survey report was drawn up on the basis of these. The reports served as the basis for suggestions regarding acceleration of construction of the commodity grain base.

The secretary and the standing committee, as well as responsible comrades from the standing committee of the provincial people's congress and the provincial people's government who were present at the conference, gave the greatest attention to each of the special reports, and after each report was read they wished immediately to deal with the questions involved and to implement suitable measures.

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## EXPORT OF SUGAR IN EXCHANGE FOR GRAIN SUGGESTED

### Zhangzhou Sugar Mill

Beijing RENMIN RIBAO in Chinese 4 May 80 p 3

[Letter from the Zhangzhou Sugar Mill, Fujian Province: "Let Fujian Specialize in Sugarcane Production"]

[Text] At present, our country still is an importer of edible sugar. It was reported that we still have to import over 1.2 million tons of sugar each year.

Central and southern Fujian Province is a region known for its mild climate, which each year receives adequate sunlight and abundant rainfall, thus constituting ideal conditions for growing sugarcane. Furthermore, local peasants have accumulated years of experience in growing this cash crop. In the area where our sugar mill is located, the output of sugarcane averages 4.6 tons per mu of land; eight production brigades which now own over 8,000 mu of land are capable of yielding 8 tons of sugarcane per mu of land, which can be processed into 1 ton of sugar.

Nevertheless, whether we can develop sugarcane production mainly depends on whether we can successfully solve the problem resulting from competition between the sectors of grain and sugarcane production for land. By reducing the grain growing acreage, we would certainly cause starvation. As long as this problem remains unsolved, the prospect of sugarcane production will not be bright.

We believe that inter-provincial coordination is needed as an effective measure to solve the food problem. For example, it is not economically feasible for such rice growing province as Zhejiang, and Hunan to grow low sugar content cane in the high rice yielding areas. Another alternative is to export sugar in exchange for food grains. The high quality sugar produced by our mill can more than meet the standards for export. It is suggested that the provinces or regions and enterprises should be authorized to export sugar in exchange for food grains.

## Fujian's Possibilities

Beijing RENMIN RIBAO in Chinese 4 May 80 p 3

[Investigation report by RENMIN RIBAO correspondent]

[Text] Shortly after receiving a letter from the Zhangzhou Sugar Mill, this correspondent visited its facilities and related provincial departments, eliciting opinions from the Fujian Provincial Party Committee's leading comrades concerned with sugarcane production. They unanimously held that the Zhangzhou Sugar Mill's suggestions deserve our great attention.

They said: Fujian is truly a lucrative sugar-producing province where roughly 2 mu of land can yield 1 ton of sugar, as against 4 mu of land in Zhejiang and Yunnan, 5 mu in Sichuan, and 6 mu in Hunan. If the state permits Fujian Province and other areas most suitable for growing sugarcane to concentrate their manpower on growing this cash crop while working out an overall plan to solve the food problem, our sugar industry is bound to develop rapidly, thus turning China into a sugar-deficit country into one with surplus sugar for export. In 1976, the state provided Fujian with 200 million jin of food grains, thus enabling it to increase its sugar output from 110,000 tons to 350,000 tons, and to register a considerable increase in the output of this cash crop year after year ever since. Just as the comrades of the Zhangzhou Sugar Mill pointed out, in the past, peasants in Fujian hesitated to grow more sugarcane for fear that it might reduce rice growing acreage and cause food shortages. Consequently, it had no alternative but to give up that lucrative sugarcane growing business. In other words, its hand and foot were tied down by growing rice alone. We believe that as long as we can plan the economy in an all-round way with due consideration for all parties concerned, break with the past policy that held every province responsible for producing enough rice to feed its own population, and take full advantage of local natural conditions and adapt them to particular crops, the sugarcane growing areas will have no difficulties in solving their food shortages. The comrades of the Zhangzhou Sugar Mill also gave us a detailed economical accounting of grain versus sugarcane growing business as indicated in their letter to RENMIN RIBAO. According to them, some rice-growing provinces and autonomous regions have been forced to grow low sugar content cane in order to alleviate them of sugar shortages. They also asked the following question: could the problem of food and sugar shortages be solved automatically by persuading those provinces suitable for growing rice to concentrate their manpower on producing this crop alone and other sugarcane-growing provinces to do likewise and then encouraging them to exchange what they have for what they do not have?

We can also export sugar in exchange for food grains. Fujian Province can produce roughly 1 ton of sugar for every 2 mu of land which can be exported to bring back 2 tons of wheat in terms of current international market prices. Not only should Fujian be encouraged to grow sugarcane but also other provinces as well where the climate is suitable for this crop. In Longxi Prefecture alone, sugarcane growing is a very lucrative business. This prefecture has 500 000 mu of land suitable for growing sugarcane. By far, only 280,000 mu of

land have been planted with sugarcane. If 500,000 mu of land were converted into sugarcane fields, 300,000 tons of sugar can be produced each year. The prefecture will have to export only 10,000 tons of sugar in exchange for an amount of food grains sufficient to feed its entire population.

Peasants in Longxi Prefecture are pleased to grow sugarcane. Sugar fresh from the mill is estimated at 1,050 yuan per ton, 600 yuan of which go to the state in form of revenue including taxes, 130 yuan are withheld by sugar processors as service charges, and the remaining 320 yuan go to the sugarcane growers as net profits. In view of this, sugarcane growing business is not only profitable to the state and collectives but also to the individual peasants as well.

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SHANGHAI AGROSCIENCE ACHIEVEMENTS PRAISED

Shanghai JIEFANG RIBAO in Chinese 6 Mar 80 p 1

[Article: "News of Victory on Our Municipality's Agrosience Fighting Line Keeps Pouring In"]

[Text] Our correspondents Tan Jiawen [0781 1367 2429] and Shi Zhitiong [2457 5347 7703] reported: News of victory from Shanghai's agrosience battle front keeps pouring in. Since the crushing of the "gang of four" 3 years ago, we have achieved more than 200 successes in agricultural science. The majority of these achievements have already been popularized and applied. This has vigorously given impetus to the development of agricultural sideline production in the suburbs of Shanghai.

The achievements which are very attention-getting are the new, high-yielding varieties of grain, cotton and oil-bearing crops. "Jianong 762" rice which was bred out at the Huating Seed Multiplication Farm in Jiading County has been expanded to more than 100,000. This newly developed variety is based on the variety of "Jianong 15." The yield per mu of "Chongmian 249," a cotton variety bred on the Chongming County Seed Multiplication Farm, is 8.5 to 18 percent higher than that of the local conventional varieties. It received high praise in the exhibition of agricultural experiments in the Changjiang area in 1979.

There have also been many successes in the production of non-staple food-stuffs. The Institute of Animal Husbandry of the Shanghai Academy of Agricultural Sciences and the Animal Husbandry and Aquatic Products Bureaus of Baoshan County and Shanghai utilized the hybrid method to produce Shanghai White Hogs. This type of pig fattens quickly, produces large litters, has a high ratio of lean meat, is strongly resistant to diseases, and is a favorite in the domestic and international markets. "Meishan Hog" purified and improved by the Leitang Breeding Stock Farm in Jiading County, one of the eight fine hog breeds, is famous throughout the country and the world. The first generation of the heat-tolerant hybrid cabbage varieties which was successfully bred by the Institute of Horticulture of the Shanghai Academy of Agricultural Sciences can reach a yield, when cultivated in the summer or fall of 3000-4000 jin per mu, an increase of more than 30 percent than that of conventional varieties.



Among these agricultural scientific and technological achievements, some of them have a relatively high level of academic value. The Weed Group at the Institute of Plant Protection of the Shanghai Academy of Agricultural Sciences has done research on the occurrence and the growth and decline of the major weeds in the farmlands. This work has filled the vacuum in weed biology in our country. The Biology Department of Fudan University and the Plant Protection Station of the Shanghai Municipal Agricultural Bureau proposed a new method of preventing and controlling the cotton aphid based on research of a natural control system and the research on other comprehensive prevention and control [methods].

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'WEN HUI BAO' COMMENTS ON AGROSCIENCE WORK

Shanghai WEN HUI BAO in Chinese 9 Mar 80 p 1

[Commentator's Article: "The Development of Agricultural Sciences Demands Immediate Attention"]

[Text] Vigorously strengthening work in agricultural science and technology to speed up the realization of agricultural modernization in the suburbs of Shanghai is the main theme of the municipality's Agricultural Science Meeting. This is also an important assignment to be confronted in the suburb's work.

Experience has repeatedly proved that to improve agriculture, the first factor is policy and the second factor is science. Under the interference and sabotage of the extreme left line of the "gang of four", agricultural production in the Shanghai suburbs remained static for 10 years. The average year-end distributed income per person in the agricultural population increased only 4 yuan. However, after crushing the "gang of four," the production of the grain, cotton and oil in 1978 broke the historical record. In the past 3 years, the average year-end distributed income per person in the agricultural population increased by more than 28 yuan. The determinant factor to bring the agriculture upward is to implement thoroughly each item of the party's agricultural policies, thus mobilizing the enthusiasm of the broad masses of peasants. In recent years, the improvement of crop varieties, the improvement of the cropping system, and the modification of cultivation techniques all greatly affected the increase in productivity. Science and technology are productivity. To make the suburbs of Shanghai the base for stable and high yields of grain, cotton, oil and non-staple foodstuffs, we should speed up the development of agricultural science and technology. This is an urgent task.

There are many favorable conditions for the development of agricultural sciences in Shanghai. Firstly, we already have a relatively well-balanced agricultural science and technology team in Shanghai. There are 27 agricultural-related societies in Shanghai. Many specialists and technical people devote themselves to agricultural sciences. A four-level agroscience network has already been established in each county.

Secondly, Shanghai is one of the important bases for our country's sciences and industries. For those agricultural research projects which are relatively difficult and involved wide areas of knowledge, we can use the brain storm method to break the difficulties. The present brain storming on rice problems has made relatively quick progress under the close cooperation of the concerned research institutes and schools of higher learning. Thirdly, the commune and brigade-run enterprises in the suburbs and the diversified economy has developed relatively fast and there has been a rather large accumulation of collective funds. These funds supply the material base for further development of scientific experiments with a mass nature. Furthermore, there are rich natural resources in the Shanghai area. The soil is fertile, it has enough rain, a long growing season, and many days of sunshine. All of these present an ideal natural environment for the developing agricultural scientific research.

Conditions in all areas of the suburbs of Shanghai are very good, however, we should also soberly realize that the crop production per unit area for the suburb is high, but not stable. Due to the effect of natural conditions yields might vary greatly. If we do not make much effort in the development and scientific research in the areas of breeding varieties, cultivation technique, meteorology, and water, how can we continue to keep increasing production? The yield of rapeseed in the suburb is very high in comparison with that of other nations in the world. However, the oil content in the rapeseed is only 38 percent. Other countries' rapeseed might have an oil content as high as over 50 percent. Can we just close our door and be satisfied with ourselves? Now the shortage of feed has restricted the development of animal husbandry. If we do not research a scientific feeding method, raise further the remuneration for feed, and feed more animals with the same amount of feed, how can we fulfill the peoples' needs for non-staple foodstuffs? At present, the supply of vegetables in our municipality is still not stable. If we do not breed a high productive variety which tolerates high and low temperatures, how can we solve the contradiction between the seasonable variations in vegetable production and the stable demand for consumption all year? To answer all of these questions in general we should emphasize, learn from and apply science. We should firmly overcome the wrong concepts such as condemning science, looking down upon the intellectuals. We should overcome the traditional way of letting small farmers lead production. We should overcome the sentiment of pride and self satisfaction.

In the work of enhancing agricultural science and technology, we should pay full attention to matching the experts' research work with scientific experiments of mass nature. The experts should work closely with the model agricultural workers and scientific research activists among the people. Those people should learn from each other's strong points to offset their own weaknesses, research together the key technical problems in developing production which urgently need to be solved, and summarize and popularize their experiences in high and stable yields. We should manage well the four-level agrosience network, establish a powerful

agrosience system, make efforts to popularize science work and continuously raise the science and culture levels of the cadres in the suburbs of Shanghai. Only by organizing a great science and technology army, can we have a strong base to carry out the agricultural modernization in the suburbs of Shanghai.

The experts in agricultural science and technology are the backbone of this army. The party committee members of various levels should use them as a dependable force to accomplish agricultural modernization, and should trust them from a political point of view, let them grow in their professions, and utilize their talent boldly from a managerial point of view. Those experts who are familiar with the business and know the party's policies should be transferred to leading groups at the different levels to strengthen them. The party committee members should support the agrosience personnel's reasonable suggestions, take care of their living and working conditions, and help them to solve some real problems.

"This year's flowering surpasses the red of last year and it is anticipated that next year's will be better." The first year of the 80's is a key year for the adjustment of the people's economy. We are facing an important task on the agricultural battle front in the suburbs, that is, to work hard to raise the production of grain, cotton, oil and non-staple foodstuffs to a new level. We must study the communique of the Fifth National People's Congress well. While we are further strengthening ideological and political work and continuing to carry out the agricultural policy of the party, we should simultaneously firmly grasp the work of agricultural science and technology and strive to win a bumper harvest in 1980.

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